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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,274	03/05/2002	Akihiro Horibe	JP920010065US1	6441

32074 7590 05/07/2003

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EXAMINER	
CALEY, MICHAEL H	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,274	HORIBE ET AL.	
	Examiner	Art Unit	
	Michael H. Caley	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 March 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

2) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4 and 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi et al. (U.S. Patent No. 5,757,447 "Kobayashi").

Regarding claims 1 and 11, Kobayashi discloses a liquid crystal display device comprising:

a fluorescent light tube as a light source (Figure 3 element 35);

a liquid crystal display panel for displaying images by controlling transmission of light from said fluorescent light tube (Figure 5);

the liquid crystal display panel having:

a color filter substrate having color filter layers of red, green and blue (Figure 5 element 16),

an opposing substrate opposed to the color filter substrate (Figure 5 element 12), and

a liquid crystal material being filled between the opposing substrate and the color filter substrate (Figure 5 element 14);

wherein the fluorescent light tube includes a phosphor having luminous efficiency equivalent to 80% and below in comparison with $LaPO_4$:Ce,Tb as a green phosphor (Column 6 lines 58-65).

a maximum peak of a radiant energy spectrum of the phosphor is included within a spectral transmissive region of the green color filter layer (Column 6 lines 58-65).

the radiant energy spectrum of the phosphor increases virtually continuously concerning points other than the maximum peak within a wavelength region where spectral transmissive regions of the blue and the green color filter layers overlap (Figure 6).

Kobayashi fails to disclose the fluorescent light tube and the color filter layers as having a relation such that a color reproduction region of light emitted from the fluorescent light tube through the color filter layers having an NTSC ratio of 85% or higher. Kobayashi discloses red, green, and blue phosphors with a given radiant energy spectrum.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the relation between the fluorescent light tube and the color filter layers such that the NTSC ratio would be 85% or 100% or higher. As stated by Applicant, it is ideal to bring an NTSC ratio of a color display system to 100%. Kobayashi discloses an equivalent low luminance green phosphor used in the liquid crystal display system as disclosed by Applicant. In conjunction with phosphors used for blue and red and a color filtering layer, one would have been motivated to create a display with a high NTSC ratio such as 85% or 100% in order to improve the display quality of the device in terms of a reproducible range of colors.

[illegible] of the green phosphor, one of ordinary skill in the art would have

optimized the filter layer using techniques old and well known in the art to optimize the image quality of the display, thus providing a maximum NTSC ratio for the given phosphors.

Regarding claim 2, Kobayashi discloses a green phosphor for which the radiant energy spectrum decreases virtually continuously concerning points other than the maximum peak within a wavelength region where spectral transmissive regions of the green color filter layer and the red color filter layer overlap (Figure 6).

Regarding claims 3 and 12, Kobayashi fails to disclose whether a wavelength of the maximum peak of the radiant energy spectrum of the green phosphor is included within a wavelength region having transmittance of 90% or higher of maximum transmittance of the green color filter layer. However, Kobayashi teaches a green filter and phosphor correspondence for which the peak of the radiant energy spectrum would act as proposed (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the green filter such that the peak of the radiant energy spectrum of the phosphor would fall within a region having at least 90% of the maximum transmittance of the filter. Such a design would have been motivated by a desire to maximize the transmitting efficiency of the phosphor and filter configuration. Such a design consideration is old and well known in the art as a means of increasing the luminance of the display while conserving power.

Regarding claims 4 and 13, Kobayashi discloses the maximum transmittance of the green color filter as 55% or higher and the maximum transmittance of the blue color filter as 40% or higher (Figure 6).

Regarding claim 9, Kobayashi discloses a tri-phosphor light tube having a luminous [illegible] equivalent to 90% or lower of the phosphors proposed in which the radiant energy of

the tri-phosphor fluorescent light tube is equivalent to 50% or lower of a maximum peak of a radiant energy of the blue phosphor at a wavelength where spectral transmittance curves of the blue and the green color filter layers intersect (Figure 6).

Regarding claim 10, Kobayashi discloses the fluorescent light tube as including the proposed composition as a green phosphor (Column 6 lines 58-65).

Regarding claim 14, Kobayashi discloses a plurality of pixel electrodes for applying electric fields to the liquid crystal material as proposed (Figure 5 element 13).

Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kobayashi in view of Kawamura (U.S. Patent No. 4,945,350).

Regarding claim 5, Kobayashi discloses a cold cathode tube disposed on a back surface of the liquid crystal display (Figure 3). Kobayashi fails to disclose an embodiment of the liquid crystal display in which a plurality of cold cathode tubes are used. Kawamura, however teaches an embodiment of a display in which a plurality of such tubes are disposed on the back surface of a display (Figures 6 and 7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used multiple tubes on the back surface of the display. The use of multiple fluorescent tubes is a means old and well known in the art of providing a specified distribution of light for a liquid crystal display device. One would have been motivated to provide multiple fluorescent tubes as an engineering expediency to provide a custom distribution of light for the device in order to benefit from the expected results of using multiple tubes.

Regarding claim 6, Kobayashi fails to disclose the fluorescent light tube and the color filter layers as having a relation such that a color reproduction region of light emitted from the fluorescent light tube through the color filter layers having an NTSC ratio of 85% or higher. Kobayashi discloses red, green, and blue phosphors with a given radiant energy spectrum.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have formed the relation between the fluorescent light tube and the color filter layers such that the NTSC ratio would be 85% or higher. As stated by Applicant, it is ideal to bring an NTSC ratio of a color display system to 100%. Kobayashi discloses an equivalent low luminance green phosphor used in the liquid crystal display system as disclosed by Applicant. In conjunction with phosphors used for blue and red and a color filtering layer, one would have been motivated to create a display with a high NTSC ratio such as 85% in order to improve the display quality of the device in terms of a reproducible range of colors. Given a known luminance of the green phosphor, one of ordinary skill in the art would have optimized the filter layer using techniques old and well known in the art to optimize the image quality of the display, thus providing a maximum NTSC ratio for the given phosphors.

Regarding claim 7, Kobayashi discloses a radiant energy spectrum of the green phosphor as proposed (Figure 6).

Regarding claim 8, Kobayashi fails to disclose whether a wavelength of the maximum peak of the radiant energy spectrum of the green phosphor is included within a wavelength region having transmittance of 90% or higher of maximum transmittance of the green color filter layer. However, Kobayashi teaches a green filter and phosphor correspondence for which the [illegible] would [illegible] as proposed (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have constructed the green filter such that the peak of the radiant energy spectrum of the phosphor would fall within a region having at least 90% of the maximum transmittance of the filter. Such a design would have been motivated by a desire to maximize the transmitting efficiency of the phosphor and filter configuration. Such a design consideration is old and well known in the art as a means of increasing the luminance of the display while conserving power.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael H. Caley whose telephone number is (703) 305-7913. The examiner can normally be reached on M-F 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

mhc
May 5, 2003